

Appendix F

Geotechnical Investigation Report

GEOTECHNICAL INVESTIGATION

PAUL HOBBS IRRIGATION RESERVOIR
11835 POCKET CANYON ROAD
GUERNEVILLE, CALIFORNIA

11993.1

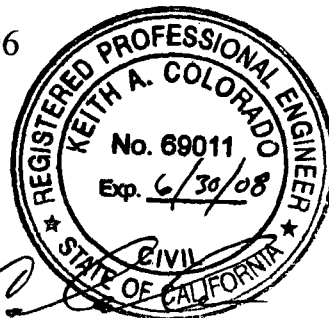
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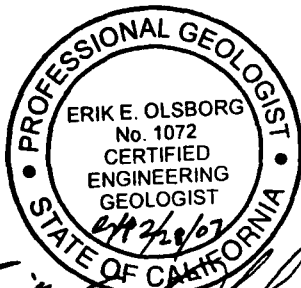
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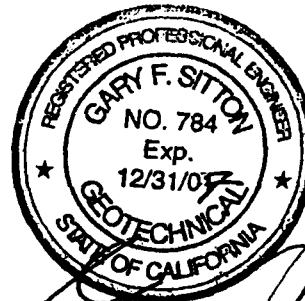
December 28, 2006



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1.0 INTRODUCTION

This report presents the results of our Geotechnical Investigation for the planned Irrigation Reservoir at 11835 Pocket Canyon Road, Guerneville, California. The property, A.P.N. 085 140 001, is located on the west side of Pocket Canyon Road (Highway 116) approximately 1.8 miles southeast of the intersection of Pocket Canyon Road and River Road, as shown on the Vicinity Map, Plate 1.

Based on discussions with Glen Edwards of Ag Wood Forestry, and our review of preliminary plans dated Aug 29, 2002, by Erickson Engineering, we understand that the Irrigation Reservoir will have two earth-fill embankments, approximately 40 and 50 feet in height on the southwest and northeast sides, respectively. The reservoir bottom will be at an assumed elevation of 350 feet and the top of the embankment at an elevation of 360 feet. The embankment will have interior slopes of about two and one-half horizontal to one vertical (2.5H:1V), and exterior slopes of 2H:1V. The planned reservoir is shown on the Site Geologic Map, Plate 2.

The purpose of our investigation was to evaluate the site soil/rock conditions in order to determine project feasibility, and to provide geotechnical conclusions and recommendations regarding site grading, including embankment and compacted soil liner construction, suitability of on-site soils for use as liner material, and the need for subdrainage, keying and benching. The scope of our services, as outlined in our Service Agreement transmitted December 9, 2005, consisted of subsurface exploration, laboratory testing, geologic and engineering analyses, and the preparation of this report.

During our investigation, we discussed our preliminary findings with Erickson Engineering. Per these discussions, we understand that the reservoir will have a synthetic liner (and not a compacted soil liner).

2.0 INVESTIGATION

2.1 Research and Reconnaissance

As part of our investigation, we reviewed the following published geologic maps:

- Preliminary Geologic Map of Western Sonoma County and Northernmost Marin County, 1971, Basic Data Contribution 12, U. S. Geological Survey.
- Geology for Planning in Sonoma County, 1980, Special Report 120, California Division of Mines and Geology (CDMG).
- Geologic Map of the Sebastopol Quadrangle, 1951, Bulletin 162, CDMG.
- Geologic Map of the Santa Rosa Quadrangle, 1982, Map No. 2A, Regional Geologic Map Series, CDMG.

Our Principal Engineering Geologist, Erik Olsborg and Project Engineer, Keith Colorado, met Glen Edwards, owner's representative, to observe and discuss the proposed site



location, and performed a reconnaissance of the site on December 6, 2005. Our Principal Geotechnical Engineer observed the site on January 24, 2006.

2.2 Field Exploration

The field exploration consisted of drilling, logging, and sampling four test borings to depths ranging from 9.5 to 15.5 feet on January 24, 2006. The test borings were drilled with a track-mounted drill rig utilizing solid stem flight auger equipment. The locations of the test borings are shown on Plate 2.

Our Project Engineer logged the test borings and obtained loose bulk samples and relatively undisturbed tube samples of the soil and rock materials encountered for visual classification and laboratory testing. The relatively undisturbed tube samples were obtained by the drill rig using a 3-inch outside diameter Modified California split-barrel sampler, driven by a 140-pound drop hammer falling 30 inches per blow. Blows required to drive the sampler were converted to equivalent "Standard Penetration" blow counts, using a conversion factor of 0.64, for correlation with empirical test data. Sampler penetration resistance (blow counts) provides a relative measure of soil/rock consistency and strength.

The logs of the test borings showing the various soil and rock materials encountered and the depths, at which samples were obtained, are presented on Plates 3 and 4. The soils are classified in accordance with the Unified Soil Classification System outlined on Plate 5. The soil descriptive properties for soil classification are presented on Plate 6, and the rock descriptive properties used to describe the bedrock materials are presented on Plate 7.

2.3 Laboratory Testing

Selected samples were tested in our laboratory to determine their pertinent geotechnical engineering characteristics. Laboratory testing consisted of moisture content/dry density, maximum dry density (compaction), classification (No. 200 sieve), and remolded permeability (triaxial cell). Compaction test data and the permeability test results are presented on Plates 8 and 9, respectively.

3.0 SITE CONDITIONS

The site for the reservoir is located in the rolling hills southwest of Guerneville on the west side of Pocket Canyon. The site is currently unoccupied and is accessed by a graded gravel road from Pocket Canyon Road (Highway 116). The reservoir site is covered with a moderate growth of grass and abundant, large fir, and some hardwood trees. The planned reservoir is within a topographic saddle on a northwest-southeast trending ridge. The topographic saddle drains to the northeast and southwest. The northwest side of the reservoir site slopes gently to the southeast at about 7H:1V. The southeast side of the reservoir slopes gently to the northwest at about 8H:1V. The northeast side of the reservoir slopes is within a drainage swale that is moderately steep to steep to the



northeast at about 3H:1V. The southwest side of the reservoir slope is at the upper edge of a ridge side that slopes steeply to the southwest at 2.3H:1V.

4.0 SITE GEOLOGY AND SOILS

The site bedrock consists of sandstone of the Cretaceous-Jurassic Franciscan Complex. The sandstone encountered in the test borings is crushed to intensely fractured, friable to low hardness, and deeply to little weathered. No bedding orientation was observed within the Franciscan Complex rocks.

The bedrock at the reservoir site is covered with about 3 to 6.5 feet of silty sand, gravelly/sandy silt to sandy clay. These soils are medium dense, soft to medium stiff, porous and contain roots; porous soils are subject to collapse when loaded in a saturated condition.

Review of published map Special Report 120 Plate 2B Slope Stability shows a possible landslide in the area. However, our boring logs in conjunction with our reconnaissance, found no evidence that there is a landslide within the area of the planned irrigation reservoir.

5.0 FAULTING AND SEISMICITY

No evidence of faulting was observed at the site, and none of the published geologic maps that we reviewed show faults in the reservoir area. The nearest active faults are the San Andreas and Rodgers Creek Faults, located approximately 10 miles southwest and 11 miles northeast of the property, respectively.

Sonoma County is within a zone of seismic activity associated with the active San Andreas and Rodgers Creek Faults. Future damaging earthquakes could occur on these faults during the lifetime of the proposed development. In general, the intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the response characteristics of the underlying earth materials.

6.0 DISCUSSIONS AND CONCLUSIONS

6.1 General

Based on the results of our field exploration and laboratory testing, we conclude that the site is geotechnically suitable for the planned reservoir. The main geotechnical constraints that should be considered in design and construction for the reservoir include the presence of weak and porous surface soils and strong seismic shaking from future earthquakes. These considerations and possible mitigation measures are discussed below along with other specific aspects of this project.



6.2 Weak, Porous, and Erodible Surface Soils

The weak and porous surface soils will collapse under embankment fill loads, and will be erodible where exposed in cut areas. Therefore, these soils should be removed and replaced as properly compacted fill within embankment areas and within reservoir cut areas where not removed by planned excavation. The interception and control of surface and subsurface water is also important in mitigation of potential erosion.

6.3 Excavatability

Considering our observation of drill rig performance at the site, and our experience in the area, we conclude that the majority of planned excavations can be achieved using conventional heavy excavation equipment, such as a Caterpillar D8R tractor, or equivalent, equipped with ripper teeth.

6.4 Seismic Hazards/Fault Rupture

The proposed reservoir will be subject to strong ground shaking from future earthquakes. With the embankment founded upon rock, and with interior and exterior slopes of 2.5H:1V and 2H:1V, respectively, the embankment should be well suited to resist the effects of ground shaking. Since no active faults were found or are shown on published references in the site vicinity, the possibility of fault rupture is considered low.

7.0 RECOMMENDATIONS

7.1 Site Preparation and Grading

Areas to be graded should be cleared of debris and surface vegetation and stripped to remove surface soils containing roots. We anticipate the depth of stripping would generally be about four to six inches. Deeper stripping and grubbing may be required to remove concentrations of organic matter. The cleared materials should be removed from the site; however, strippings can be stockpiled for later use as topsoil.

The reservoir embankments should be founded on supporting rock; therefore, the upper weak and porous surface soils (average of 3 to 6.5 feet in thickness, may be thicker in some areas) should be removed from embankment areas and the zone extending at least five feet beyond the exterior embankment toes. The excavated soils, minus remaining organic matter and over-size rocks (greater than six inches in largest dimension), can be stockpiled for later use as embankment fill material.

Fill placed upon existing slopes should be keyed and benched into firm, weathered rock. The downstream embankment toes should be supported by keyways excavated into firm rock. The keyways should be equipment width (10 to 12 feet), and extend at least two feet into crushed, friable to low hardness rock on the downstream side. A subdrain will be needed within the keyway, as determined by BACE during the excavation process.



The subdrain should be constructed in accordance with the Keyway Drainage Detail, Plate 10.

Within reservoir cut areas where not removed by planned excavation, weak-porous or soft soils should be removed. After planned excavations are completed and weak-porous soils are removed, the exposed soils should be scarified to at least 6 inches in depth, moisture conditioned to (and maintained at) a uniform moisture content at least 2 percent above optimum moisture content, and compacted to at least 90 percent relative compaction (RC). Embankment fill materials should be placed in horizontal layers eight inches or less in loose thickness, moisture conditioned to (and be maintained) at least 2 percent above optimum moisture content, and compacted to at least 90 percent RC, using self-propelled compactors or sheepsfoot rollers. Smooth-wheel rollers should not be used except for final subgrade preparation.

The downstream slope of the embankment should be inclined no steeper than 2H:1V, preferably at 2-1/2H:1V. The upstream face of the embankment should be inclined no steeper than 2-1/2H:1V, preferably at 3H:1V. Fill slopes should be compacted by rolling and trimming, or overfilled and trimmed back to planned grade, to expose a firm, smooth surface free of loose material. Slopes should be planted with vegetation (or protected from erosion by other measures) upon completion of grading.

7.2 Synthetic Liner

The synthetic liner should be at least 60 millimeters in thickness high-density polyethylene (HDPE). The liner should be installed, and each joint penetration sealed, per the manufacturer's recommended procedures. If no other requirement is provided, the edges should be overlap at least 24 inches. The liner installation should be observed and tested in accordance with the manufacturer's requirements.

The liner could be punctured if placed on rock containing angular fractures. Therefore, fractured rock exposed on the reservoir sides and bottom should be over excavated and replaced with compacted (at least 90 percent RC) on-site material, at least 8 inches in thickness. If the synthetic liner is not installed, BACE should be retained to provide recommendations for a compacted (imported) soil liner.

7.3 Rip Rap

If used, such as at outlets for spillway or over-flow pipe, the riprap section should be about two-feet thick and placed over geotextile filter fabric (Mirafi 700X, or equivalent). Riprap rock should be sound, and resistant to abrasion and reasonably free from cracks, seams, and other defects that would tend to increase unduly their destruction by water action. Riprap rock should be between six inches and two feet in size and carefully fitted together to provide a tight interlock.



7.4 Surface and Subsurface Drainage

Surface water runoff should be intercepted and directed away from the top and toe of cut and fill slopes. Drainage ways should be maintained free of debris to prevent water from eroding along the top or toe of the slopes.

Depending upon the time of year, ground water seepage may be encountered during embankment excavation operations. Excessive seepage may occur within the northwesterly cut slope during the winter-spring months. As a precaution, an uphill subdrain is suggested, as shown on Plate 11.

Surface and subsurface water should be collected in solid pipes and outletted into the existing or established drainage system(s) on site. Alternatively, the collected water can be directed to (by gravity) or pumped into the reservoir.

7.5 Additional Services

Prior to construction, BACE should review the final grading and reservoir construction plans, and related specifications, for conformance with our recommendations. During construction, BACE should be retained to provide periodic observations, together with field and laboratory testing, during site preparation, keyway excavation, subdrain installation, placement and compaction of fills for embankment construction and liner installation. Reservoir excavations should be reviewed by BACE while the excavation operations are being performed. Our observations and tests will allow us to verify conformance of the work to project guidelines, determine that soil conditions are as anticipated, and to modify our recommendations, if necessary.

8.0 LIMITATIONS

This geotechnical investigation and review of the proposed reservoir development were performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report. Our conclusions are based upon reasonable geologic and engineering interpretation of available data. A soil corrosion study was not included in our scope of services for this project.

The samples taken and tested, and the observations made, are considered to be representative of the site; however, soil and geologic conditions may vary significantly between test borings and across the site. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by BACE and revised recommendations be provided as required.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, that the information and recommendations contained herein are brought to the attention of all other design professionals for the project, and incorporated



into the plans, and the Contractor and Subcontractors implement such recommendations in the field. The safety of others is the responsibility of the Contractor. The Contractor should notify the Owner and BACE if he/she considers any of the recommended actions presented herein to be unsafe or otherwise impractical.

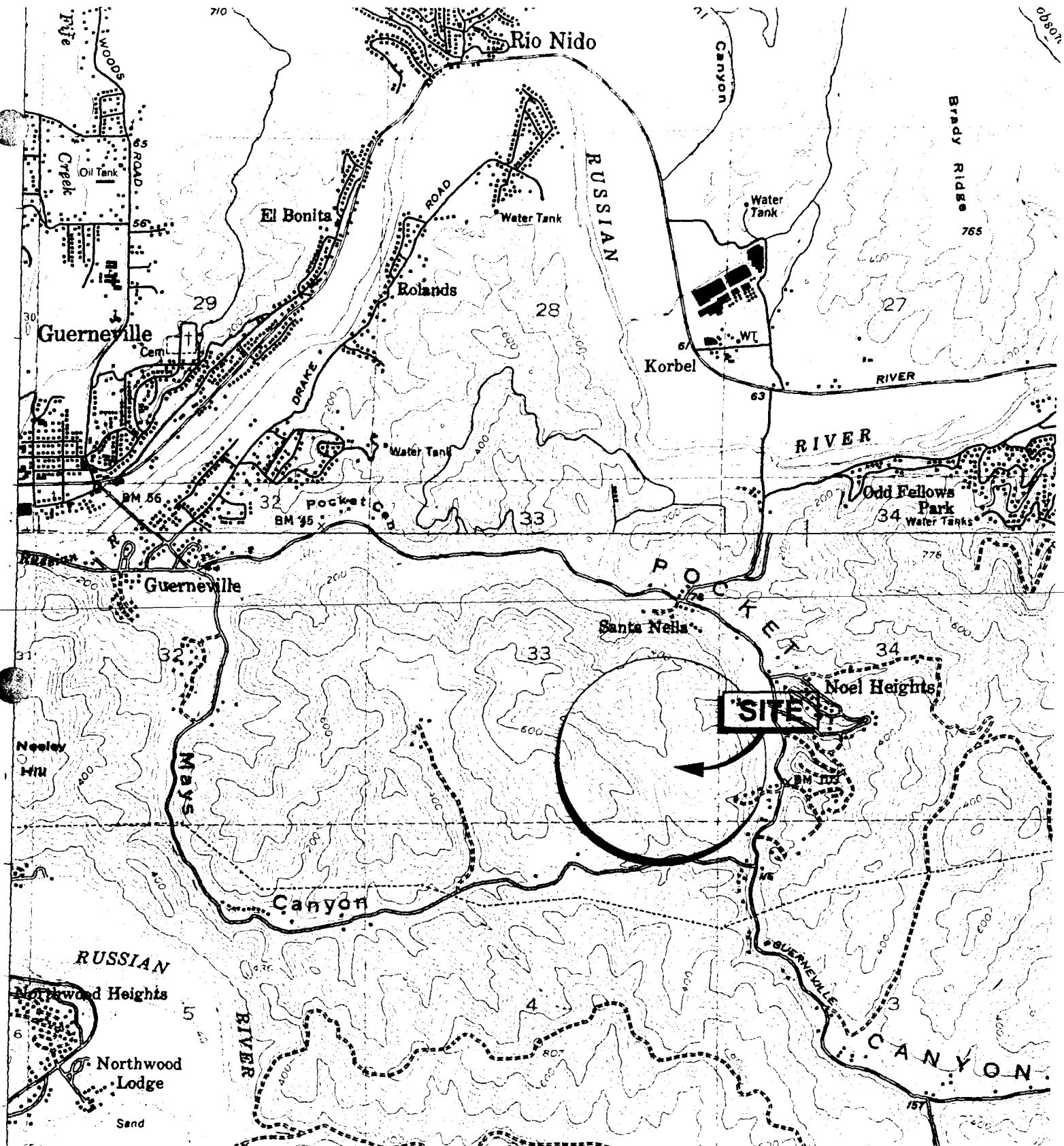
Changes to the conditions of a site can occur with the passage of time, whether they are due to natural events or to human activities on this, or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The recommendations contained in this report are based on certain specific project information regarding type of construction and reservoir location, which has been made available to us. If any conceptual changes are undertaken during final project design, we should be allowed to review them in light of this report to determine if our recommendations are still applicable.



ILLUSTRATIONS



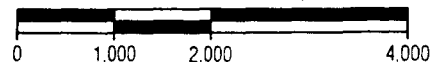


REFERENCE:

Campmeeker 1971 and Guerneville 1993,
7.5 Minute Quadrangle Topographic Map, USGS



APPROXIMATE SCALE (FEET)



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F-213

VICINITY MAP
PAUL HOBBS IRRIGATION RESERVOIR
11835 Pocket Canyon Road
Guerneville, California

PLATE

1

channel

280

2000' Vineyard

access road

oil tank where

Reservoir by
others

24" HDPE $n = .012$

$L = 300'$ pipe outlet

B-2

B-3

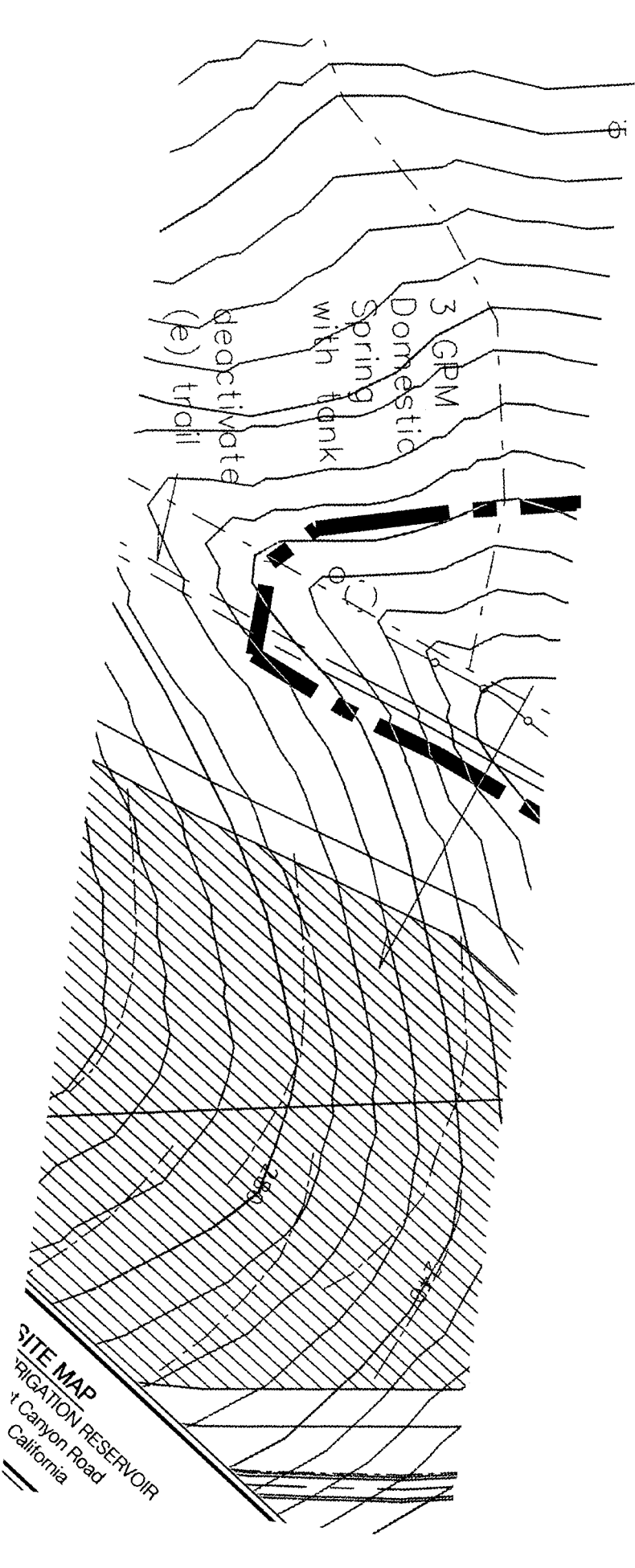
Line 4.1

10" HDPE

$n = .015$

$L = 250'$

PROXIMATE



SITE MAP
IRRIGATION RESERVOIR
at Canyon Road
California

Laboratory Tests

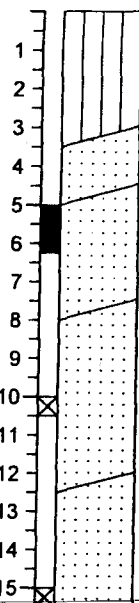
Moisture Content (%)
Dry Density (pcf)
Blows/foot*

18.5 103 37

32/4"

32/1.5" ∇

Depth (ft.)
Sample



DARK RED-BROWN GRAVELLY SILT (ML)
soft to medium stiff, porous

OLIVE-BROWN SANDSTONE
crushed, friable, deeply weathered

OLIVE-BROWN SANDSTONE
crushed, friable to low hardness, moderately weathered

ORANGE-RED-BROWN SANDSTONE
crushed, low hardness to moderately hardness, moderately weathered

becomes moist to wet at about 12'

RED-BROWN-GRAY SANDSTONE
crushed moderate hardness to hard, moderately weathered

Notes:
(1) Free water encountered at 15 feet during drilling
(2) No caving

Log of Boring B-1

Equipment: Mobile B-40; 5-inch flight auger

Date: 1/24/06

Logged By: KAC Elevation: 320 feet **

Laboratory Tests

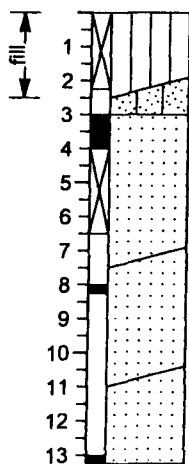
Moisture Content (%)
Dry Density (pcf)
Blows/foot*

18.2 105 32

13.3 109 32/3"

32/2"

Depth (ft.)
Sample



RED-BROWN SANDY SILT (ML)
soft, wet, porous

LIGHT ORANGE-BROWN SILTY SAND (SM)
medium dense to dense, moist

LIGHT ORANGE-BROWN SANDSTONE
crushed, soft to friable, deeply weathered

LIGHT ORANGE-BROWN SANDSTONE
crushed, moderate hardness to hard, moderately weathered

ORANGE-RED-BROWN WITH WHITE SANDSTONE
crushed moderate hardness to hard, moderately weathered

Notes:
(1) No free water encountered
(2) No caving

Log of Boring B-2

Equipment: Mobile B-40; 5-inch flight auger

Date: 1/24/06

Logged By: KAC Elevation: 355 feet **

31% Passing #200
See compaction and permeability test data on Plates 8 and 9, respectively

* Equivalent "Standard Penetration" Blow Counts.
** Elevations interpolated from Plate 2.

Scale: 1" = 5'



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LOGS OF BORINGS B-1 AND B-2

PAUL HOBBS IRRIGATION RESERVOIR
11835 Pocket Canyon Road
Guerneville, California

F-215

PLATE
3

Laboratory Tests

Laboratory Tests

See compaction and permeability test data on Plates 8 and 9, respectively

62% Passing #200

26.5

87

30

68% Passing #200

9.1

115

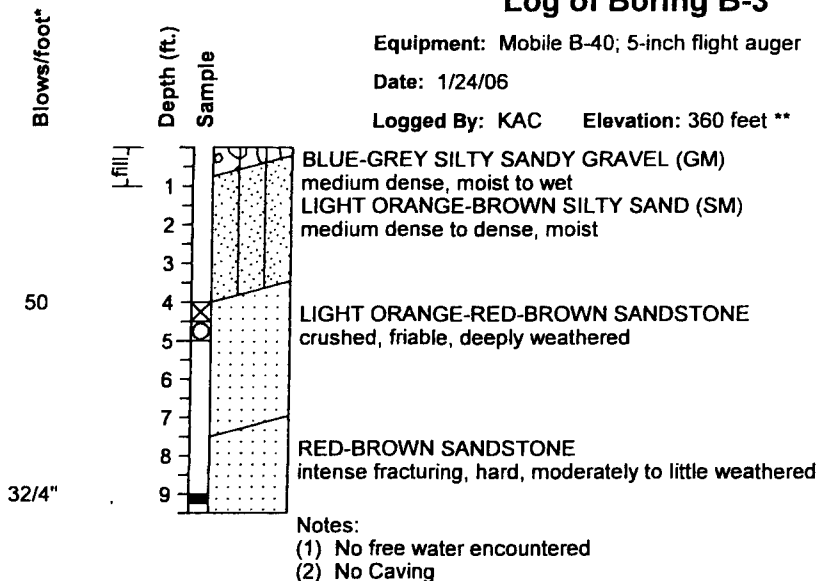
38/6"

Log of Boring B-3

Equipment: Mobile B-40; 5-inch flight auger

Date: 1/24/06

Logged By: KAC Elevation: 360 feet **

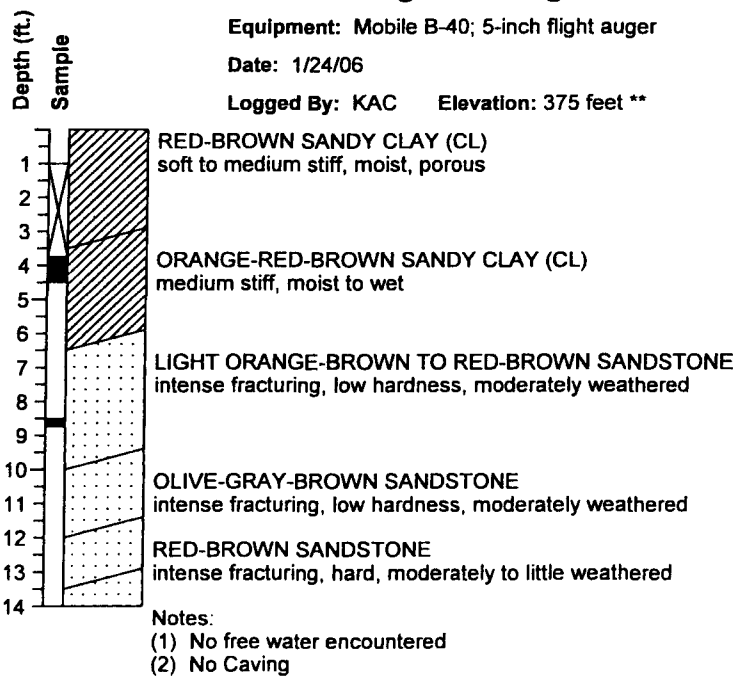


Log of Boring B-4

Equipment: Mobile B-40; 5-inch flight auger

Date: 1/24/06

Logged By: KAC Elevation: 375 feet **



* Equivalent "Standard Penetration" Blow Counts.
** Elevations interpolated from Plate 2.

Scale: 1" = 5'



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











LOGS OF BORINGS B-3 AND B-4

PAUL HOBBS IRRIGATION RESERVOIR
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F-216

PLATE

4

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)	MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
				GRAPH	LETTER	
	COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (Little or no fines)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
					GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GRAVELS WITH FINES (Appreciable amount of fines)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
		SAND AND SANDY SOILS 50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	CLEAN SANDS (Little or no fines)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
					SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SANDS WITH FINES (Appreciable amount of fines)		SM	SILTY SANDS, SAND-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
		HIGHLY ORGANIC SOILS			PT	PEAT, HUMOUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

Consol - Consolidation

LL - Liquid Limit

PI - Plasticity Index

EI - Expansion Index

SA - Sieve Analysis

■ Sample Retained

▨ Sample Recovered, Not Retained

⊠ Bulk Sample

□ Sample Not Recovered

Shear Strength, psf

Confining Pressure, psf

Tx 320 (2600) - Unconsolidated Undrained Triaxial

TxCU 320 (2600) - Consolidated Undrained Triaxial

DS 2750 (2600) - Consolidated Drained Direct Shear

FVS 470 - Field Vane Shear

UC 2000 - Unconfined Compression

PP 2000 - Field Pocket Penetrometer

Sat - Sample saturated prior to test

▽ Ground Water Level During Exploration

▽ Stabilized Ground Water Level



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SOIL CLASSIFICATION CHART & KEY TO TEST DATA

PAUL HOBBS IRRIGATION RESERVOIR

11835 Pocket Canyon Road

Guerneville, California

F-217

PLATE

5

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
Very loose	4 or less
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	More than 50

CONSISTENCY OF FINE-GRAINED SOILS

Consistency	Identification Procedure	Approximate Shear Strength (psf)
Very soft	Easily penetrated several inches with fist	Less than 250
Soft	Easily penetrated several inches with thumb	250 to 500
Medium stiff	Penetrated several inches by thumb with moderate effort	500 to 1000
Stiff	Readily indented by thumb, but penetrated only with great effort	1000 to 2000
Very stiff	Readily indented by thumb nail	2000 to 4000
Hard	Indented with difficulty by thumb nail	More than 4000

NATURAL MOISTURE CONTENT

Dry	No noticeable moisture content. Requires considerable moisture to obtain optimum moisture content* for compaction.
Damp	Contains some moisture, but is on the dry side of optimum.
Moist	Near optimum moisture content for compaction.
Wet	Requires drying to obtain optimum moisture content for compaction.
Saturated	Near or below the water table, from capillarity, or from perched or ponded water. All void spaces filled with water.

* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

Where laboratory test data are not available, the above field classifications provide a general indication of material properties; the classifications may require modification based upon laboratory tests.



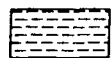
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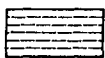
SOIL DESCRIPTIVE PROPERTIES
PAUL HOBBS IRRIGATION RESERVOIR
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F-218

PLATE
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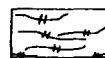
Generalized Graphic Rock Symbols



Claystone



Siltstone



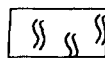
Tuff (Volcanic Ash)



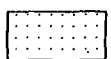
Shale



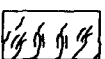
Chert



Andesite



Sandstone



Serpentine



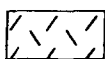
Basalt



Conglomerate



Metamorphic Rock



Granite

Stratification

Bedding of Sedimentary Rocks

Massive
Very thick bedded
Thick bedded
Thin bedded
Very thin bedded
Laminated
Thinly laminated

Thickness of Beds

No apparent bedding
Greater than 4 feet
2 feet to 4 feet
2 inches to 2 feet
0.5 inches to 2 inches
0.125 inches to 0.5 inches
less than 0.125 inches

Fracturing

Fracturing Intensity

Little
Occasional
Moderate
Close
Intense
Crushed

Thickness of Beds

Greater than 4 feet
1 foot to 4 feet
6 inches to 1 foot
1 inch to 6 inches
0.5 inches to 1 inch
less than 0.5 inches

Strength

Soft
Friable
Low hardness
Moderate hardness
Hard
Very hard

Plastic or very low strength.
Crumbles by hand.
Crumbles under light hammer blows.
Crumbles under a few heavy hammer blows.
Breaks into large pieces under heavy, ringing hammer blows.
Resists heavy, ringing hammer blows and will yield with difficulty only dust and small flying fragments.

Weathering

Deep Moderate to complete mineral decomposition, extensive disintegration, deep and thorough discoloration, many extensively coated fractures.

Moderate Slight decomposition of minerals, little disintegration, moderate discoloration, moderately coated fractures.

Little No megascopic decomposition of minerals, slight to no effect on cementation, slight and intermittent, or localized discoloration, few stains on fracture surfaces.

Fresh Unaffected by weathering agents, no disintegration or discoloration, fractures usually less numerous than joints.



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ROCK DESCRIPTIVE PROPERTIES

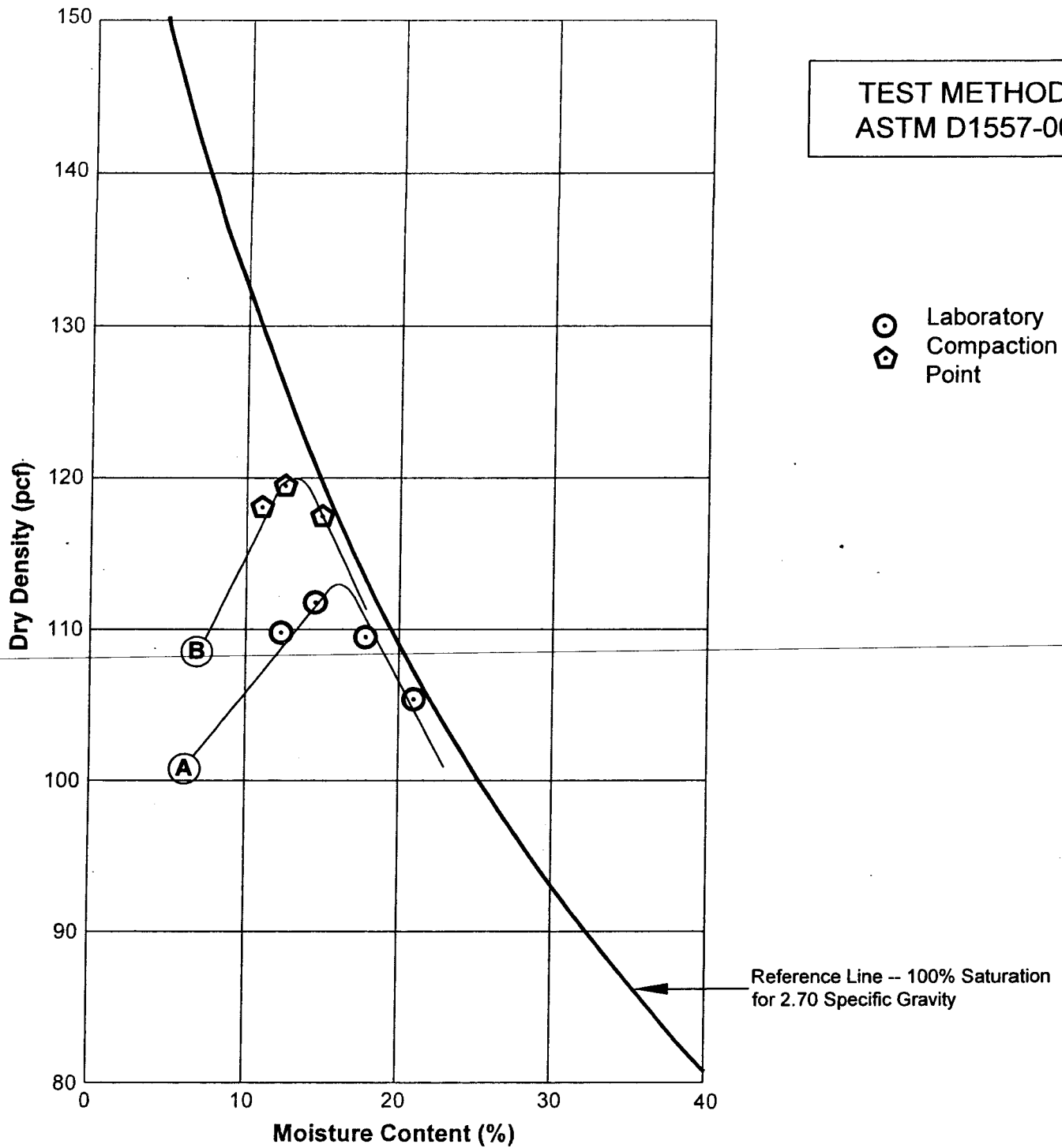
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F-219

PLATE

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TEST METHOD
ASTM D1557-00



Symbol	Sample Source	Classification	Optimum Moisture (%)	Maximum Dry Density (pcf)
○ A	Boring B-4 at 1-4 feet	RED-BROWN CLAYEY SAND (SC)	16.0	113
◡ B	Boring B-2 at 3-6.5 feet	LIGHT ORANGE-BROWN SANDSTONE	13.5	120



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COMPACTION TEST DATA
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PLATE

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Sample Source	Classification	(1) Remolded Dry Density (pcf)	(1) Remolded Moisture Content (%)	(2) Permeability (cm/sec.)	Percent Passing No.200 Sieve
Ⓐ Boring B-4 at 1-4 feet	RED-BROWN SANDY CLAY (CL)	102	20.8	6×10^{-8}	65
Ⓑ Boring B-2 at 3-6.5 feet	LIGHT ORANGE-BROWN SANDSTONE	108	15.2	1×10^{-6}	31

NOTES:

- (1) Sample remolded to about 90% relative compaction and about 2 to 4% over optimum moisture content based on laboratory compaction test performed in accordance with the ASTM D-1557-00 test method; see compaction data on Plate 8.
- (2) Permeability tests performed in accordance with ASTM D-5084.



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**SUMMARY OF FLEXIBLE WALL
PERMEABILITY TEST DATA**

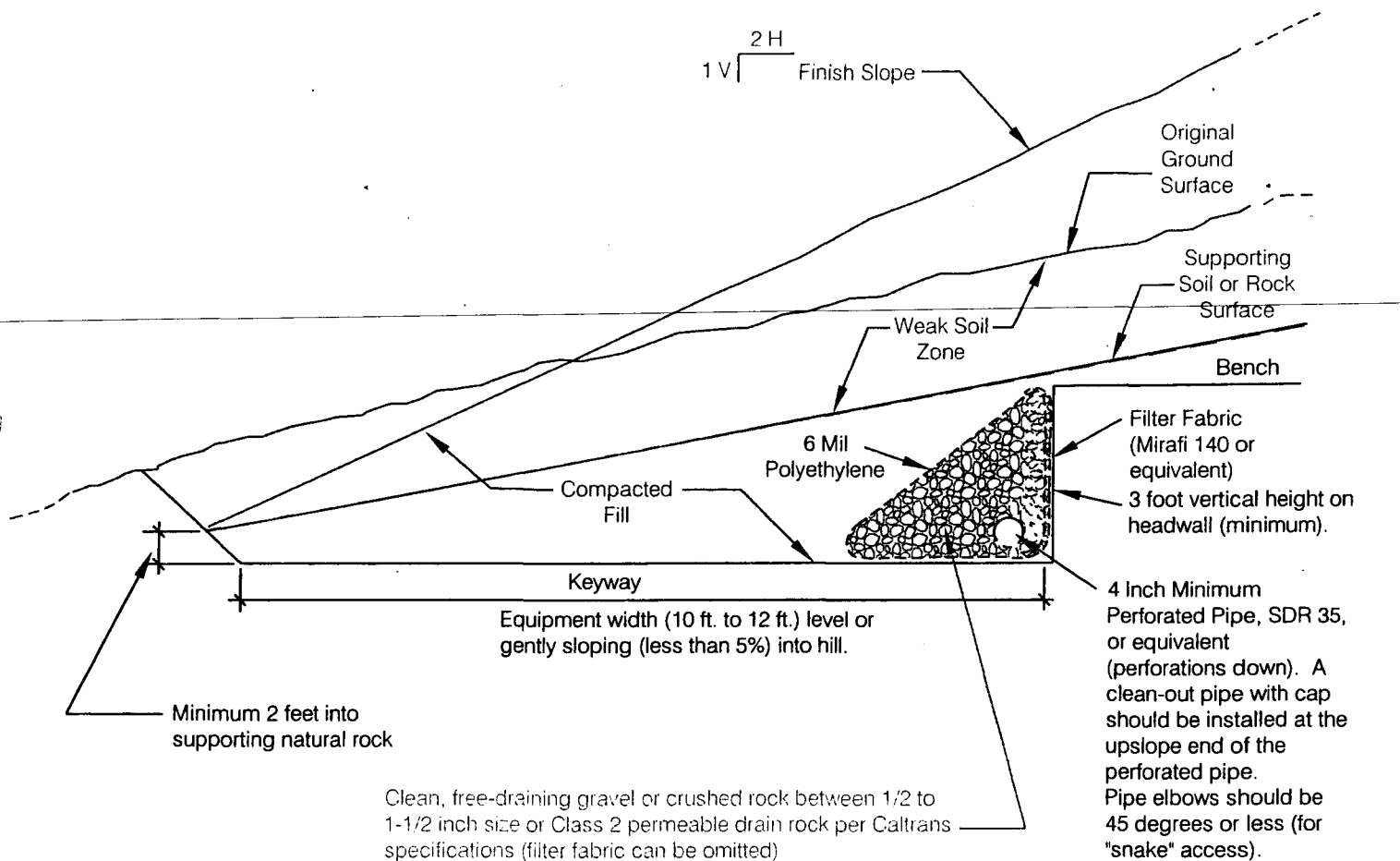
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PLATE

9

(NOT TO SCALE)



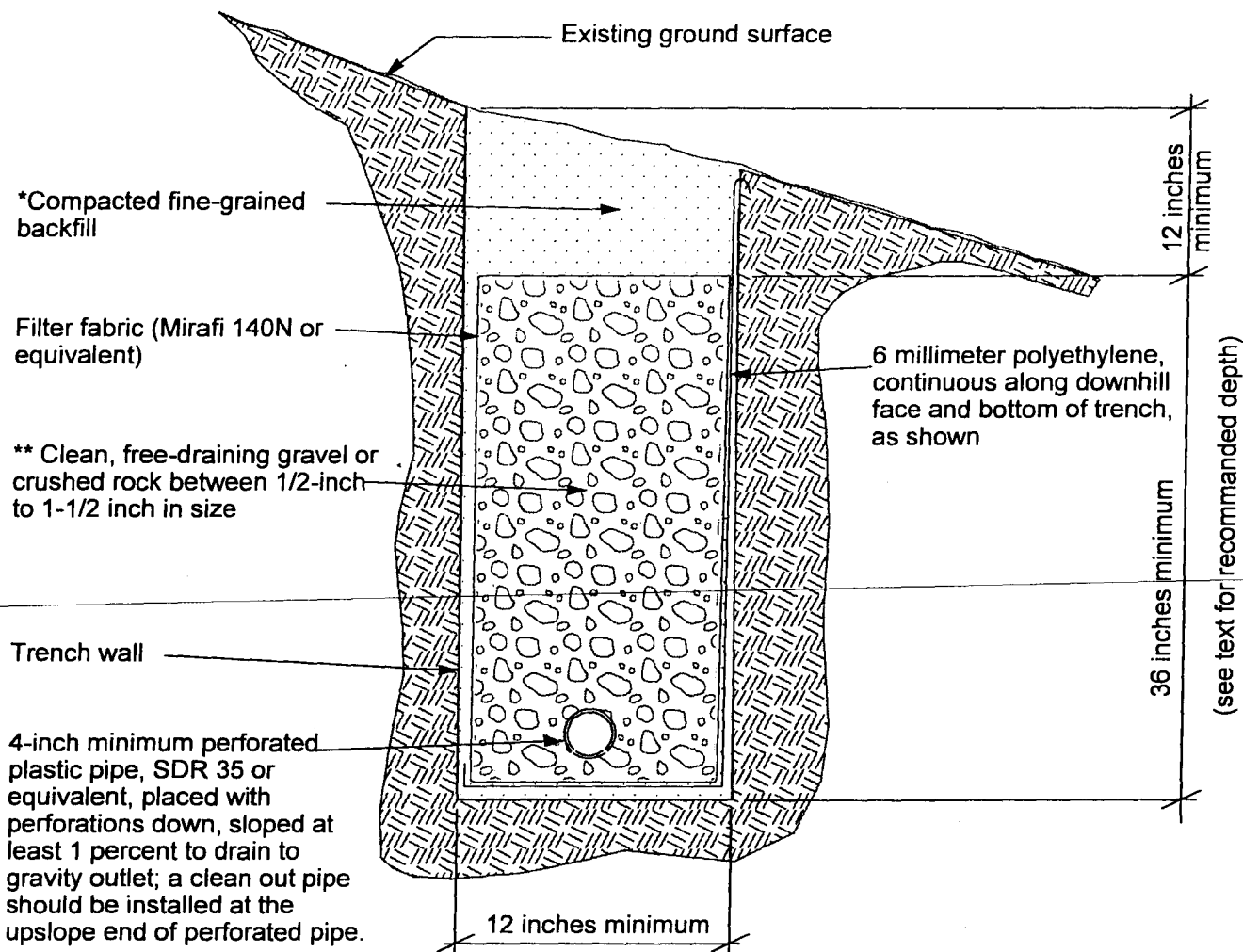
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KEYWAY/BENCH DRAINAGE DETAIL
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PLATE
10



**TYPICAL SECTION
NO SCALE**

* 90 percent relative compaction minimum in accordance with ASTM D 1557 Test Method, latest edition.

** Or, as an alternative, use Class 2 Permeable Material per Caltrans specifications.

 <p>BACE GEOTECHNICAL a division of Brunser Associates, Inc. (707) 528-6108</p>	Job No. 11993.1	<p>TYPICAL TRENCH SUBDRAIN DETAIL PAUL HOBBS IRRIGATION RESERVOIR 11835 Pocket Canyon Road Guerneville, California</p> <p>F-223</p>	<p>PLATE 11</p>
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	Date. 12/28/06		

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